Remarks

Entry of the foregoing amendments and reconsideration of this application is requested. By this amendment, the specification, drawings, and claims 1, 15, 17, and 19 have been amended to more specifically set forth the invention. Claim 14 has been canceled herein without prejudice. Claims 1-13 and 15-25 remain in the application.

Objections

The Examiner has objected to the disclosure stating that reference numeral "20", page 6, line 12, does not appear in FIG. 3. In response, the applicant's are submitting herewith an amended FIG. 3, showing reference numeral "20". The applicant asserts that a typographical error was initially included in which reference numeral "25", located at the lower right portion of originally presented FIG. 3, was incorrectly noted. This reference numeral has been amended to numeral "20".

The Examiner has objected to reference character "40" stating that it has been used to designate both "supporting substrate 40", page 13, line 4, and "entire board 40", page 16, line 6. The applicant believes that the Examiner intended to mean "entire board 40", page 14, line 6. In response, the applicant's have amended this instance to state "substrate 40".

It is believed the amendments to FIG. 3 and to the specification overcome the Examiner's objections. No new matter has been added by these amendments.

Claim Rejections - 35 U.S.C. § 102(e)

The Examiner has rejected claims 1-4, 6, 8-10, 13-15, 17-20 and 23 under 35 U.S.C. 102(b) as being anticipated by Kubota, et al, U.S. Patent No. 5,644,107, hereinafter referred to as Kubota. The Examiner asserts that Kubota discloses the method of forming a device similar to that of the applicants. Accordingly, the Examiner concludes that Kubota anticipates the applicant's instant invention.

The applicant respectfully disagrees with these rejections and asserts that the applicant's claims as amended herein do not read on the device of Kubota. The applicant asserts that while Kubota discloses a method of manufacturing a multilayer electronic component, it fails to disclose the inclusion of the step of providing a connection pad on a lower surface of a lowermost first sheet of unfired ceramic material and contacting the lower surface of the portion of the via filled with conductive metal.

The applicant asserts that the Kubota patent discloses a small electronic component in which stress relief is not of issue due to the small size of the completed device. Accordingly, there is not included a connection pad on a lowermost surface of the lowermost first sheet of material and contacting the lower surface of the portion of the via filled with conductive metal for the purpose of

mounting it to a substrate and reducing stress. The device of Kubota is mounted directly on the surface of the substrate, and thus does not include this additional element (connection pad) which is ultimately sandwiched between a mounting pad formed on the substrate and the lowermost surface of the module when forming the component for mounting. The applicants assert that there is no disclosure in Kubota to include the step of providing a connection pad on a lower surface of each module and contacting the lower surface of the portion of the via filled with conductive metal in the periphery as is disclosed and claimed by the applicants.

The inclusion of a separately formed connection pad on a lowermost surface of the final material layer, and in contact with the via provides for stress relief in the applicant's device due to its large overall device area, which provides for increased density in the applicant's device. As stated on page 14, lines 7-12 of the applicant's originally presented specification, ".....a connection and/or mounting pad 46 is provided on the lower surface of the lower sheet 25 of module 21 in contact with the lower surface of each via 32. Pad 46 has a surface area larger than the cross-sectional area of a via 32 (see FIG. 8) so as to spread the stress over a larger area.

The applicant asserts that independent claims 1 and 17 as amended herein, each require the inclusion of a connection pad formed on the lower surface of the lower sheet of each module in contact with the lower surface of each via. There is no such disclosure in the device or method of Kubota. Furthermore, the applicants assert that it is not obvious to add such a connection pad to the device of Kubota in that Kubota is formed having a minimum device area and as such does not need the

added stress relief, which in turn would not provide for the direct mounting of the component of Kubota onto the substrate surface, as indicated in FIG. 6 of Kubota.

Accordingly, the applicant asserts that there is clearly no anticipation in the disclosure of Kubota to disclose the inclusion of a connection pad as defined and claimed by the applicant. This exclusion from a prior art reference is enough to negate anticipation by this reference. To anticipate a claim for a patent, a single prior source must contain all its essential elements. Each limitation of a claim must be found in a single reference, practice, or device. In that the Kubota patent fails to claim this inclusion of the step of providing a connection pad on a lower surface of the first sheet of material and contacting a lower surface of the portion of the via filled with conductive metal as now included in the applicant's amended claims, there is clearly no anticipation by Kubota. This exclusion of a claimed element from a prior art reference is enough to negate anticipation by this reference.

Accordingly, the applicant believes that the above detailed remarks made herein now set forth the invention so as to differentiate it from the device of Kubota. For the reasons set forth above, the applicant does not believe that the above reference anticipates the applicant's claims. Therefore, the applicant believes that claims 1 and 17 are now in condition for allowance. The applicant therefore also believes that claims 2-4, 6, 8-10, 13, 15, 18-20 and 23, depending therefrom, respectively, are also in condition for allowance in that they must contain each and every element of the claim from which they depend. In light of the above arguments, the applicant believes the 35 U.S.C. 102 rejection in light of the teaching

of Kubota has been overcome. Therefore, the applicant believes that claims 1-4, 6, 8-10, 13, 15, 17-20 and 23 are now in condition for allowance. Notice to that effect is respectfully requested. Claim 14 has been canceled herein. Claim 15 has been amended to change dependency in light of the cancellation of claim 14.

Claim Rejections - 35 U.S.C. § 103(a)

The Examiner has rejected claims 5 and 7 under 35 U.S.C. 103(a) as being unpatentable over Kubota in view of Shigemi et al, U.S. Patent No. 6,350,334, hereinafter referred to as Shigemi. The Examiner in making this rejection states that Kubota discloses the sheets of unfired ceramic material, but does not disclose the sheets of Al2O3 and glass particles as claimed in claim 5. The Examiner asserts that Shigemi discloses "glass powder such as CaO, Al_2O_3, SiO_2.....comprising a binder, a plasticizer, and solvent, may be used". Therefore, the Examiner asserts it would have been obvious to one having ordinary skill in the art at the time the invention was made to have modified the method of Kubota by providing the sheets of unfired ceramic material to include sheets of Al2O3, glass particles and a binder in view of the teaching of Shigemi.

With respect to claim 7, the Examiner asserts that Kubota does not disclose a conductive metal with a melting temperature greater than the firing temperature. The Examiner further asserts that Shigemi discloses "the conductive paste has a sintering (melting) temperature higher than that of the green sheet", in order to

prevent the conductive paste from melting and leaking out of the holes in the process of firing of the green sheets. Therefore, the Examiner asserts that it would have been obvious to one having ordinary skill in the art at the time the invention was made to have modified the method of Kubota by providing a conductive metal with a melting temperature greater than the firing temperature in view of Shigemi in order to prevent the conductive paste from melting and leaking out of the holes in the process of firing of the green sheets.

Next, the Examiner has rejected claims 11, 12, 21, and 22 under 35 U.S.C. 103(a) as being unpatentable over Kubota. Regarding claims 11 and 21, the Examiner states that Kubota discloses the pluralities of providing result in the common via, but Kubota does not disclose in detail the "extending in a range from approximately.....an upper sheet". Regarding claims 12 and 22, the Examiner asserts that Kubota discloses forming a hole, but does not disclose in detail a cross-sectional dimension range of approximately 125-500 μm. The Examiner asserts that the exact dimensions of the produce would have been an obvious matter of design choice to one having ordinary skill in the art, since such modifications would have involved a mere change in size of the design.

The applicant asserts that in light of the amendments presented herein, the claims do not read on the device of Kubota in view of Shigemi nor Kubota standing alone. Specifically, the applicants have amended claims 1 and 17 to include the step of providing a connection pad on a lower surface of the first sheet of material and contacting a lower surface of the portion of the via filled with conductive metal.

Depending claims 5, 7, 11, 12, 21, and 22 must contain this step in that they depend from these claims, respectively. Claim 5 includes this step of forming the connection pad and further includes the step of providing sheets of Al2O3, glass particles and a binder. Claim 7 includes this step of forming the connection pad and further includes the step of using a conductive metal with a melting temperature greater than the firing temperature. Claim 12 includes this step of forming the connection pad and further includes the step of forming a hole with a cross-sectional dimension in a range of approximately 125 μm to approximately 500μm. Claim 21 includes this step of forming the connection pad and further defines the provided plurality of sheets of material as having a common via extending in a range of approximately 25 μm to approximately one half of a distance between a lower surface of a lower sheet of unfired ceramic material and an upper surface of an upper sheet of unfired ceramic material. Claim 22 includes this step of forming the connection pad and further includes forming a hole with a cross sectional dimension in a range of approximately 125 μm to approximately 500 μm.

The device of Kubota fails to disclose a connection pad formed as specified by the applicant as previously described with regard to the 35 U.S.C. 102 rejection. Further modification of the method of Kubota with the teachings of Shigemi, also fails to disclose the applicant's inventive method and render it obvious.

Therefore, in light of these amendments and remarks, the Applicants assert that claims 5, 7, 11, 12, 21 and 22 are in a condition for allowance in that they depend from claims 1 and 17, respectively, and must contain each and every

element of the claim from which they depend. In light of the above arguments, the Applicant believes the 35 U.S.C. 103 rejection in light of the teaching of Kubota and Kubota in view of Shigemi has been overcome. Therefore, the Applicant believes that claims 5, 7, 11, 12, 21, and 22 are now in condition for allowance. Notice to that effect is respectfully requested.

Allowed Claims

The applicant acknowledges and accepts the allowance of claim 25.

No amendment made was related to the statutory requirements of patentability unless expressly stated herein. No amendment made was for the purpose of narrowing the scope of any claim, unless the Applicant has argued herein that such amendment was made to distinguish over a particular reference or combination of references..

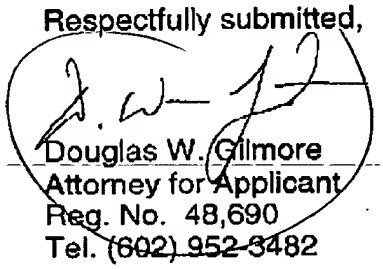
The Applicant believes that the subject application, as amended, is in condition for allowance. Such action is earnestly solicited by the Applicant. In the event that the Examiner deems the present application non-allowable, it is requested that the Examiner telephone the Applicant's attorney or agent at the number indicated below so that the prosecution of the present case may be advanced by the clarification of any continuing rejection.

CT 00-020
PATENT

SUMMARY: Reconsideration is respectfully requested. In view of the foregoing amendments and remarks it is believed that the application, including claims 1-13 and 15-25, is now in condition for allowance. Notice to that effect is respectfully requested.

Authorization is hereby given to charge any fees necessitated by actions taken herein, including any extension of time fees, to Deposit Account 13-4771.

Respectfully submitted,



Douglas W. Gilmore
Attorney for Applicant
Reg. No. 48,690
Tel. (602) 952-3482

SEND CORRESPONDENCE TO:

MOTOROLA, INC.
Law Department
Customer Number: 23330

In the Drawings

Provided herewith is a revised FIG. 3.

Amendment to the Specification

Please amend the specification as follows:

Page 14, line 6, please delete "board" and insert therefore --substrate--.

Version of Claims with Markings to Show Changes Made

Please amend the claims as follows:

1. (Amended) A method of fabricating a low profile integrated module comprising the steps of:

providing a first sheet of material defining two adjacent integrated module first components, and forming a via extending through the first sheet between the two adjacent integrated module first components;

filling the via with a conductive metal;

providing a second sheet of material defining two adjacent integrated module second components;

providing a connection pad on a lower surface of the first sheet of material and contacting a lower surface of the portion of the via filled with conductive metal;

fixing the first and second sheets in overlying relationship with the two adjacent integrated module first components aligned with the two adjacent

integrated module second components to form two adjacent integrated modules; and

cutting the first and second sheets, through the via to separate the first and second sheets into separate integrated modules, each module having a portion of the via filled with conductive metal in a periphery thereof and extending along a portion of the periphery.

Please cancel claim 14 without prejudice.

15. (Amended) A method of fabricating a low profile integrated module as claimed in claim [14] 1 wherein the step of providing the connection pad includes providing a connection pad with a contact surface area substantially greater than a cross-sectional area of the portion of the via.

17. (Amended) A method of fabricating a low profile integrated module comprising the steps of:

providing a plurality of first sheets of unfired ceramic material each defining two adjacent integrated module first components, and forming a plurality of vias extending through the plurality of first sheets between the two adjacent integrated module first components;

filling each of the plurality of vias with a conductive metal paste;

providing a plurality of second sheets of unfired ceramic material each defining two adjacent integrated module second components;

providing a connection pad on a lower surface of a lowermost sheet of the plurality of first sheets of unfired ceramic material and contacting the lower surface of the portion of the via filled with conductive metal;

fixing the plurality of first sheets and the plurality of second sheets in overlying relationship with the two adjacent integrated module first components aligned with the two adjacent integrated module second components to form two adjacent integrated modules;

cutting the fixed pluralities of first and second sheets, through the pluralities of vias to separate the fixed pluralities of first and second sheets into two separate integrated modules, each module having a portion of each of the plurality of vias in a periphery thereof and extending along a portion of the periphery; and

firing the two separate integrated modules at a firing temperature high enough to form ceramic modules, the conductive metal having a melting temperature greater than the firing temperature.

19. (Amended) A method of fabricating a low profile integrated module as claimed in claim 17 wherein the step of providing one of the plurality of first sheets of unfired ceramic material with an enlarged opening includes a step of at least partially filling the enlarged opening with the conductive metal paste thereby forming the connection pad in contact with the lower surface of the portion of the via filled with conductive metal in the periphery.